

FQ5-574

28

What is claimed is:

1. A multiple access communications system comprising:
a master station; and
a plurality of slave stations, each of which is connected to the
master station using a multiple access controlled uplink and a broadcasting
5 downlink and is connected to at least one terminal, wherein each of the slave
stations comprises:
a transmission buffer for storing data received from a terminal as uplink
transmission packets;
a condition memory storing a transmission condition for packet
10 concatenation;
a packet concatenation section for concatenating a plurality of uplink
transmission packets stored in the transmission buffer within a range satisfying the
transmission condition, to produce a concatenated uplink transmission packet; and
a transmitter for transmitting the concatenated uplink transmission packet
15 to the master station.

2. The multiple access communications system according to claim 1,
wherein the packet concatenation section concatenates a plurality of uplink
transmission packets within an upper limit to number of uplink transmission packets
determined by the transmission condition.

20 3. The multiple access communications system according to claim 1,
wherein the packet concatenation section concatenates a plurality of uplink

FQ5-574

29

transmission packets within an upper limit to a total amount of uplink transmission packets determined by the transmission condition.

4. The multiple access communications system according to claim 1, wherein the transmission condition is previously set such that concatenation of the plurality of uplink transmission packets is performed only when a total amount of first additional information that would be added if the uplink transmission packets are individually transmitted is not smaller than an amount of second additional information that would be added if the concatenated uplink transmission packet is transmitted,

wherein the packet concatenation section concatenates the plurality of uplink transmission packets when the transmission condition is satisfied.

5. The multiple access communications system according to claim 4, wherein the slave station further comprises:

a table memory storing a table containing correspondence between a packet data size and an amount of additional information to be added when individually transmitted.

wherein the table is used to determine whether the total amount of first additional information is not smaller than the amount of second additional information.

6. The multiple access communications system according to claim 4, wherein the slave station further comprises:

a table memory storing a table containing correspondence between a packet data size, a number of packets to be concatenated, an amount of additional

FQ5-574

30

information to be added when concatenated, and

wherein the table is used to determine whether the total amount of first additional information is not smaller than the amount of second additional information.

- 5 7. A multiple access communications system comprising:
- a master station; and
- a plurality of slave stations, each of which is connected to the master station using an uplink and a downlink and is connected to at least one fixed speed data terminal, wherein
- 10 the master station comprises a time synchronization packet transmitter for transmitting a time synchronization packet to the slave stations to obtain time synchronization with the slave stations, and
- each of the slave stations comprises:
- a converter for converting all fixed speed data received from the at least
- 15 one fixed speed data terminal to uplink transmission data packets in synchronization with the time synchronization packet, and
- a transmitter for starting transmission processing of the uplink transmission data packets when the fixed speed data from all of the at least one fixed speed data terminal have been stored.

- 20 8. The multiple access communications system according to claim 7. wherein each of the slave stations further comprises:
- a detector for detecting at least one fixed speed data terminal that is in an active state,

wherein the transmitter starts the transmission processing of the uplink

FQ5-574

31

transmission data packets when the fixed speed data from all of the at least one fixed speed data terminal that is in the active state has been stored.

9. The multiple access communication system according to claim 7,
wherein the master station periodically transmits a transmission permission packet
5 to the slave stations,

wherein the converter converts the fixed speed data to uplink transmission data packets in synchronism with the transmission permission packet, and the transmitter performs transmission of the uplink transmission data packets according to timing designated by the transmission permission packet.

10. A multiple access communications system comprising:
a master station; and
a plurality of slave stations, each of which is connected to the master station using a multiple access controlled uplink and a broadcasting downlink and is connected to at least one terminal, wherein each of the slave
15 stations transmits an uplink data packet and an uplink control information packet to the master station as an uplink transmission data packet, wherein each of the slave station comprise:

a first buffer for storing uplink transmission data packets;

a second buiffer for storing uplink transmission data packet status
20 information indicating a status of each of the uplink transmission data packets; and

a buffer controller controlling such that, when an uplink transmission data packet is stored in the first buffer, a control flag is set to not-changeable and is added to uplink transmission data packet status information corresponding to the uplink transmission data packet, and the uplink transmission data packet status

FQ5-574

32

information with the control flag set to not-changeable is stored in the second buffer.

11. The multiple access communication system according to claim 10, wherein the buffer controller previously sets an upper limit to a number of uplink transmission data packets to be set to not-changeable, wherein, when a number of uplink transmission data packets exceeds the upper limit, the buffer controller sets the control flag to changeable and adds it to uplink transmission data packet status information corresponding to uplink transmission data packets exceeding the upper limit, to store the uplink transmission data packet status information with the control flag set to changeable in the second buffer.

12. The multiple access communication system according to claim 11, wherein each of the slave stations further comprises a condition memory storing a transmission condition for packet concatenation,

wherein, when a number of uplink transmission data packets set to not-changeable falls below the upper limit, the buffer controller determines whether the uplink transmission data packets set to changeable stored in the first buffer satisfy the transmission condition, and

when the uplink transmission data packets set to changeable satisfy the transmission condition, the buffer controller sets a control flag of uplink transmission data packet status information corresponding to each of the uplink transmission data packets set to changeable to not-changeable, and concatenates the uplink transmission data packets set to changeable in sequence to produce a concatenated uplink transmission packet for transmission to the master station.

13. The multiple access communication system according to claim 10,

FQ5-574

33

wherein the buffer controller controlling such that, when the uplink control information packet is stored in the first buffer, the uplink control information packet is stored at a location of the first buffer immediately before the uplink transmission data packets set to not-changeable stored in the first buffer.

5 14. A data transceiver connected between a master station and at least one terminal to transfer data between the master station and the at least one terminal, comprising:

 a transmission buffer for storing data received from a terminal as uplink transmission packets;

10 a condition memory storing a transmission condition for packet concatenation;

 a packet concatenation section for concatenating a plurality of uplink transmission packets stored in the transmission buffer within a range satisfying the transmission condition, to produce a concatenated uplink transmission packet; and

15 a transmitter for transmitting the concatenated uplink transmission packet to the master station.

 15. A data transceiver connected between a master station and at least one fixed speed data terminal to transfer data between the master station and the at least one terminal, comprising:

 a packet data generator for generating uplink transmission data packets from fixed speed data received from the at least one fixed speed data terminal, in synchronization with a time synchronization packet received from the master station to; and

FQ5-574

34

a data packet transmitter for performing transmission processing of the uplink transmission data packets when the fixed speed data from all of the at least one fixed speed data terminal have been received.

16. A data transceiver connected between a master station and at least one terminal to transfer data between the master station and the at least one terminal, comprising:

a first buffer for storing uplink transmission data packets;

a second buffer for storing uplink transmission data packet status information indicating a status of each of the uplink transmission data packets; and

10 a buffer controller controlling such that, when an uplink transmission data packet is stored in the first buffer, a control flag is set to not-changeable and is added to uplink transmission data packet status information corresponding to the uplink transmission data packet, and the uplink transmission data packet status information with the control flag set to not-changeable is stored in
15 the second buffer.

17. A method for transferring data between a master station and at least one fixed speed data terminal, comprising the steps of:

storing data received from a terminal as uplink transmission packets:

20 concatenating a plurality of uplink transmission packets stored in the transmission buffer within a range satisfying a transmission condition for packet concatenation, to produce a concatenated uplink transmission packet; and

transmitting the concatenated uplink transmission packet to the master station.

FQ5-574

35

18. A method for transferring data between a master station and at least one fixed speed data terminal, comprising the steps of:

generating uplink transmission data packets from fixed speed data received from the at least one fixed speed data terminal, in synchronization with a time synchronization packet received from the master station to; and

performing transmission processing of the uplink transmission data packets when the fixed speed data from all of the at least one fixed speed data terminal have been received.

19. A method for transferring data between a master station and at least one terminal, comprising the steps of:

storing uplink transmission data packets in a first buffer;

storing uplink transmission data packet status information indicating a status of each of the uplink transmission data packets in a second buffer;

when an uplink transmission data packet is stored in the first buffer, setting a control flag to not-changeable and adding it to uplink transmission data packet status information corresponding to the uplink transmission data packet; and

storing the uplink transmission data packet status information with the control flag set to not-changeable in the second buffer.

20. A multiple access communication method between a master station and a plurality of slave stations, each of which is connected to the master station using an uplink and a downlink and is connected to at least one terminal, comprising the steps of:

FQ5-574

36

at a slave stations

generating a plurality of data packets from data received from the
at least one terminal;

transmitting a transmission request packet containing a total
5 amount of data packets to be concatenated to the master station;

at the master station,

in response to the transmission request packet, transmitting a
transmission permission packet containing a total amount of data packets permitted
to be concatenated to the slave station;

10 at the slave station,

concatenating a plurality of uplink transmission data packets
within a predetermined range to produce a concatenated uplink transmission data
packet; and

transmitting the concatenated uplink transmission data packet to
15 the master station.

10032003 022602